

Automatic Vehicle Location (AVL) and You

July 18, 2008

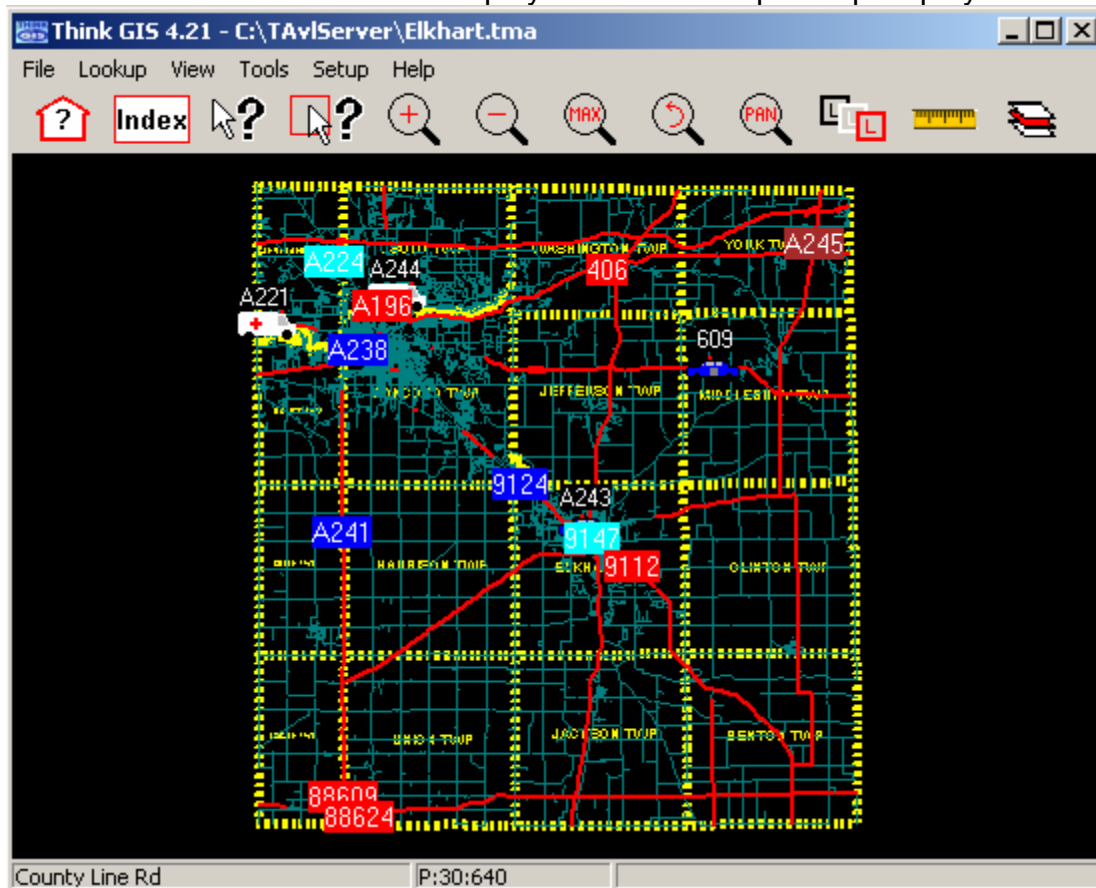
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1 What Does AVL Do

The following functionality is common to many AVL applications

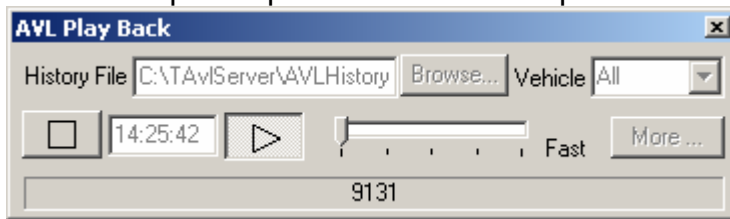
1.1 Live Display Applications

- Provides a simple means of determining who is closest to a location requiring service.
- Makes it possible to locate unresponsive officers
- Easier to stage multiple units.
- Click on a unit to learn additional information reported by the vehicle such as current speed.
- Display accuracy is around +/-10ft making it possible for dispatcher to know precisely where vehicle is
- Individual units can be differentiated by colors, icons, and/or text.
- Display updates every second. Vehicle locations update at rate limited by wireless infrastructure. Typically once every five seconds for high band width (i.e. cellular) or once every 30 seconds for lower band widths.
- AVL information can be displayed live on multiple map displays



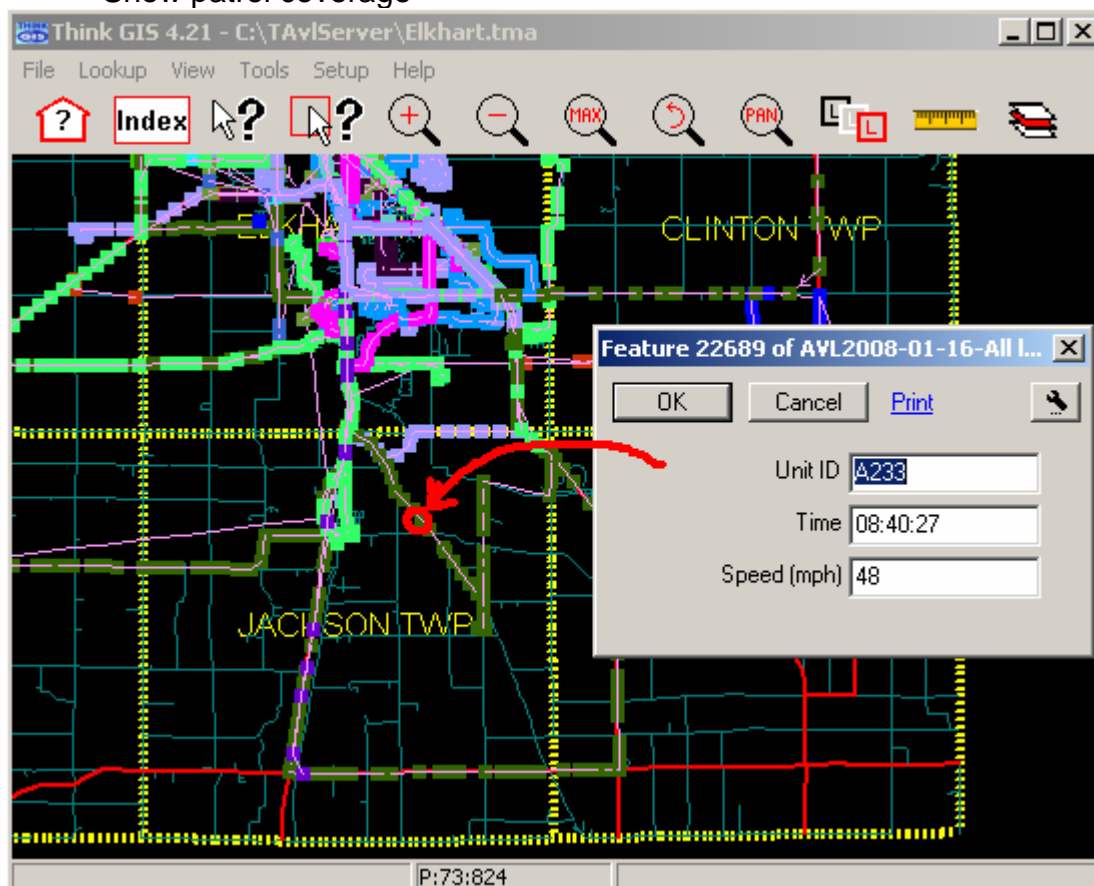
1.2 History Playback

Replay vehicle movements for any date in history for all vehicles or select vehicles. Speed up. Slow Down. Jump to certain time.



1.3 Export History To A Map Layer

- Show chain of time stamped points for all or select vehicles
- Check arrival or departure times by clicking on a point
- Provide evidence that someone was at a certain place at a certain time.
- Show patrol coverage



1.4 Export History To A Text Report

- Similar information as graphical report above but in text format.

```
=====
Vehicle ID = A230
=====
Log File   = C:\TAvlServer\AVLHistory\AVL2008-01-16.txt
Start Time = 00:00:00
Stop Time  = 24:00:00

Time      Location                               Status
-----
13:41:57  2nd St/Clinton St                        23 mph
13:41:57  2nd St/Lincoln Ave                          Stopped for 21 min (48 gps reports)
14:02:27  2nd St/Lincoln Ave                          31 mph
14:02:27  3rd St/Washington St                       Stopped for 1 min (3 gps reports)
14:03:24  3rd St/Washington St                       45 mph
14:03:42  Washington St/State Road 15                 30 mph
14:03:42  Washington St/3rd St                       Stopped for 1 min (1 gps reports)
14:04:12  Washington St/3rd St                       21 mph
14:04:27  State Road 15/Jefferson St                 43 mph

...

Total distance driven = 53 miles
```

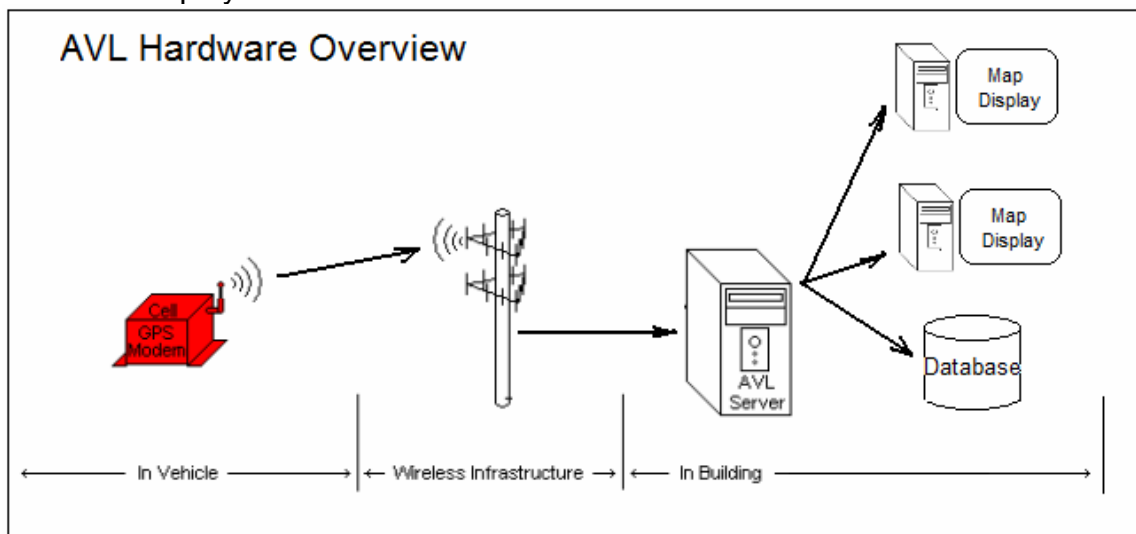
1.5 Other Features/Applications

- Flag certain vehicles as undercover units so that they do not get displayed on live maps but do get recorded in history.
- Dynamically change vehicle labels on map to reflect new officer ID during shift changes
- Send out alarms via email whenever certain events occur such as speeding, unresponsiveness, boundary crossing.

2 How Does AVL Work

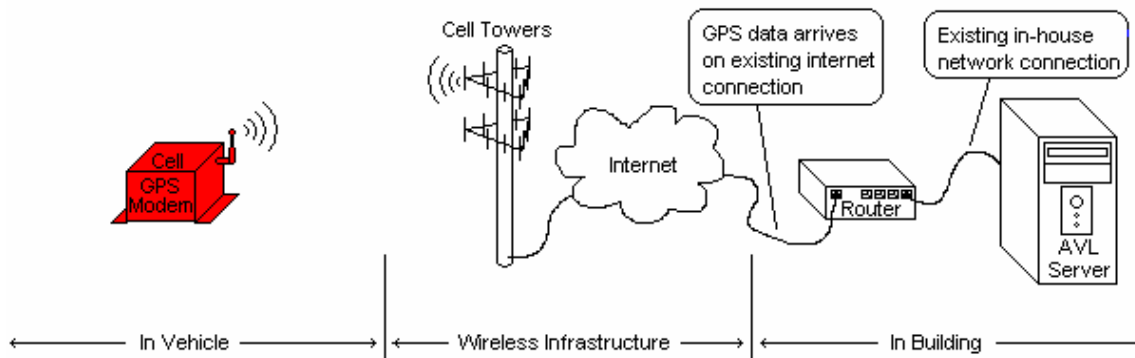
2.1 Overview

- Each vehicle is equipped with some combination of GPS receiver and wireless communication equipment.
- In vehicle equipment is programmed with a report interval, a unique vehicle ID, and a destination address for GPS reports. The most common data format is "TAIP" but some hardware brands support only their own custom format.
- Some type of wireless infrastructure delivers GPS reports from vehicle back to base.
- Server software at the base interprets the X,Y coordinates and ID of each report. The SQL database is updated.
- Each map display software queries the server once per second to refresh its display with the latest locations.



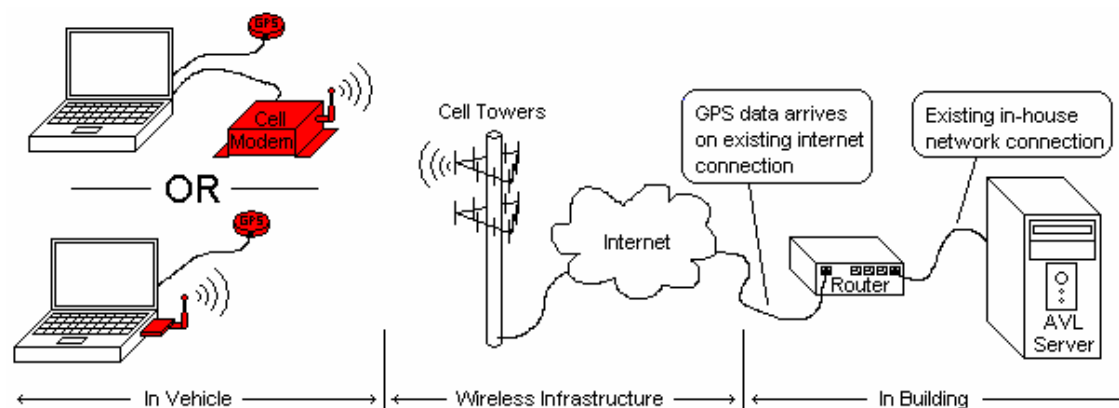
2.2 Cellular Example

- GPS/Cellular modem black box mounted in trunk. Hardware cost ranges from \$500 to \$800. Common brands include “Bluetree” and “Sierra Wireless”.
- Requires monthly cell phone data plan costing up to \$60/month
- Data arrives over internet so no wiring to do in building
- Provides internet access to any optional laptop connected to modem.
- Same network can be shared by other mobile data applications.
- No laptop or user interface is required.
- Modems can have dynamic or static IP addresses. Building must have static IP address provided by ISP.
- Modems can typically be programmed remotely.
- AVL server can echo Fleet location information back out to vehicle so that in-car map can view other vehicles.
- No limit to how many vehicles can be tracked simultaneously.



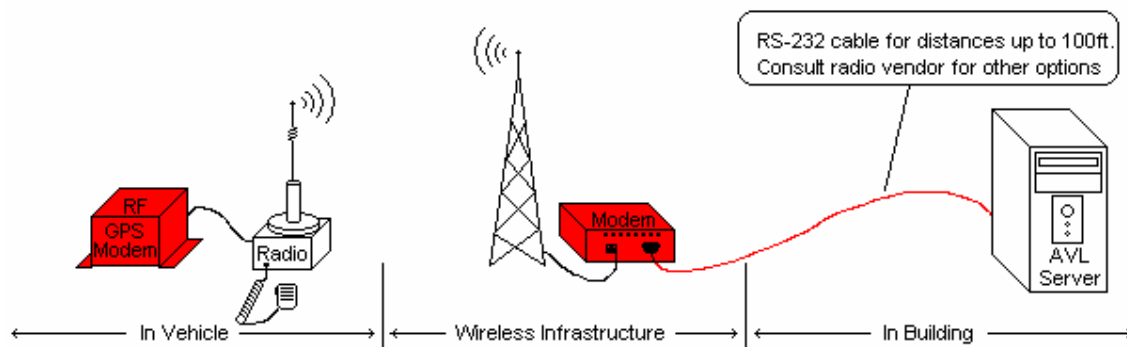
2.3 Cellular + laptop example

- Same as above example except as follows:
- Assumes laptop already exists.
- Common GPS receiver cost is only \$80. Common Cellular modem can be purchased for as little as \$0 with monthly data plan.
- Free AVL client software forwards GPS location to server via modem.
- Similar configuration can work on any IP based wireless network.



2.4 RF Example

- Can work on most existing radio infrastructures.
- Separate frequency is typically used so that data bursts do not interfere with voice.
- GPS modem in car costs \$500 to \$800. May work with existing voice radio but sometimes requires separate radio.
- Only one server application can typically be connected to the network.
- Much lower band width compared to cellular. Typical setup might only be capable of tracking 20 cars with reports every 15sec. Or more cars at lesser rate.
- No ongoing monthly usage fees!!



2.5 Other Notes

- AVL Server software can be interfaced with Computer Aided Dispatch (CAD) software to enrich the live AVL display with
 - Status (i.e. Enroute, onscene, available),
 - Information about current assignments
 - Officer name currently assigned to this vehicle.
- AVL Server maintains "State" table in SQL database so that other applications can read live location information for each unit.

3 About The Demo

The following software applications were used in the demonstration:

FleetSimulator: A WTH Technology application that generates TAIP formatted TCP/IP GPS reports and sends them to any AVL server based on pre-recorded AVL data.

TAvlServer: A WTH Technology application that reads incoming TCP/IP or RS232 GPS reports from a variety of common formats. Data is archived, alarms are generated, and X,Y locations are forwarded to map displays.

TAvlPlayback: A WTH Technology application that comes with TAvlServer. Works closely with ThinkGIS for replaying or reporting pre-recorded AVL history.

ThinkGIS: A WTH Technology application for viewing and editing maps. Can be configured to poll one or more AVL Servers for live fleet location information.

Presenters:

Steve Leatherman: Introduction, wsleatherman@wthengineering.com

Ben Hill: AVL How To, bhill@wthengineering.com

Matt Alexander: Customer experience, nvfd114@yahoo.com